



Potential for Expanding the Near Real Time ForWarn Regional Forest Monitoring System to Include Alaska

Presented to the 2014 US-IALE Meeting by:

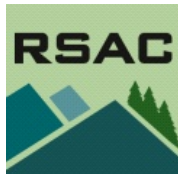
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Introduction



- U.S. forests occupy ~1/3 of total land area (~304 million ha)
- AK forests comprise ~52 million ha, including 1st and 2nd largest national forests in the nation (Tongass and Chugach NFs)
- U.S. forests face many biotic and abiotic threats that cause regional forest damage – and also impact human life and property, bio-diversity and water supplies
- Timely regional forest disturbance monitoring products are needed to aid forest health management work
- Since 2010, the US Forest Service ForWarn Early Warning System has used daily MODIS data to provide regional forest monitoring products every 8 days
- However...ForWarn currently only covers the lower 48 states with potential to include Alaska, Hawaii, etc.

U.S. ForWarn System for Regional Forest Disturbance Monitoring

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<http://forwarn.forestthreats.org>

CONTACT US

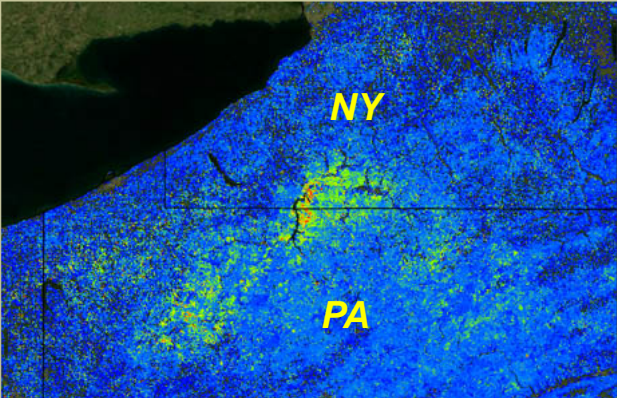
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ForWarn

Satellite-Based Change Recognition and Tracking



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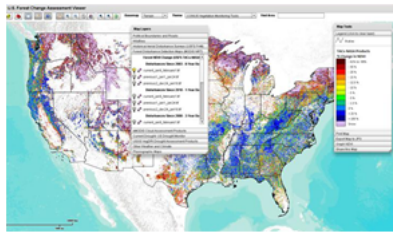
Monitoring Gypsy Moth defoliation in near real time

By late 2012, forest health monitors in western New York and Pennsylvania knew that they were about to experience a severe outbreak of the non-native Gypsy Moth. Surveys showed an unusually high density of egg masses on the branches and trunks of...


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What is ForWarn?

ForWarn is a satellite-based forest disturbance monitoring system for the conterminous United States. It delivers new forest change products every eight days and provides tools for attributing abnormalities to insects, disease, wildfire, storms, human development or unusual weather. Archived data provide disturbance tracking across all lands since 2000. Interactive maps are accessible via the [Forest Change Assessment Viewer](#). Read more about ForWarn [here](#).



Recent News

[ForWarn highlights report published](#)
09/06/2013 - 07:59 A Forest Service General Technical Report highlighting detections made by the ForWarn system is available online. See [here...](#)
 [GTR_SRS180LARGE.PDF](#)

[ForWarn awarded NASA Group Achievement Award](#)
07/08/2013 - 08:01 The ForWarn development team was awarded the NASA Group Achievement Award in recognition for creating the first near real-time forest threat early warning system...

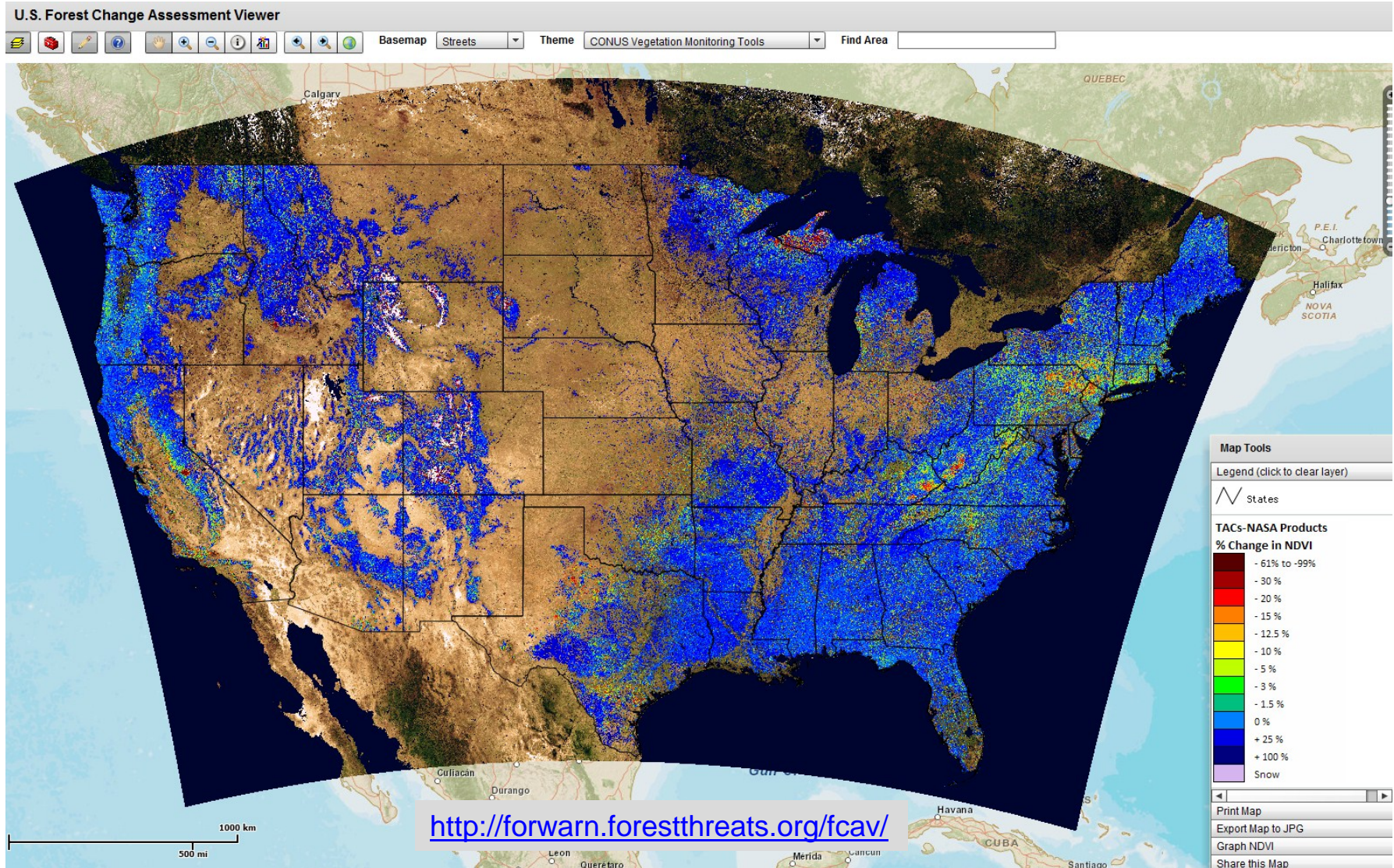
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U.S Forest Change Assessment Viewer (FCAV) Resident to ForWarn

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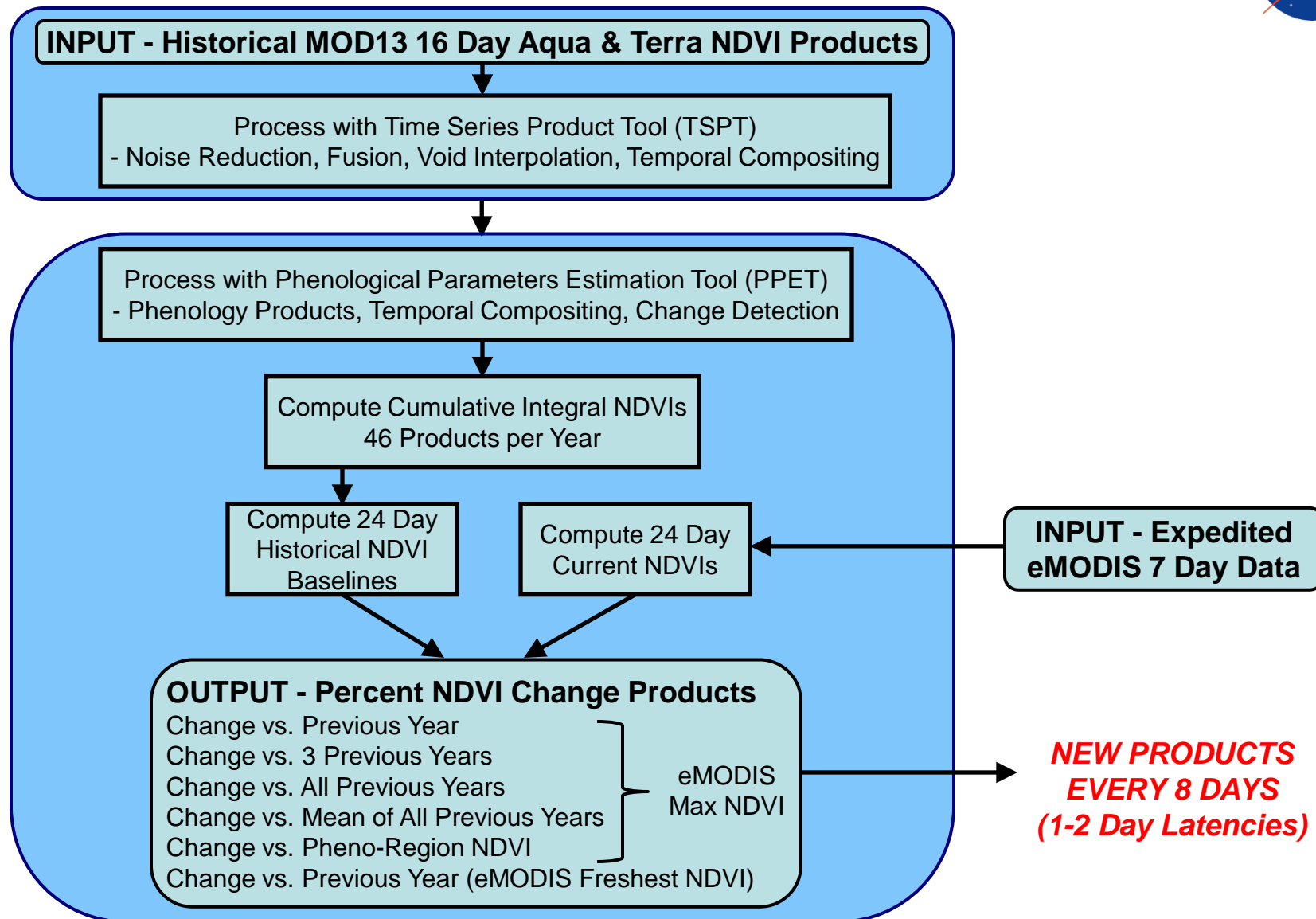


2013 Forest % NDVI Change versus Previous Year for October 24 - November 16



Process for Computing ForWarn's MODIS NDVI Change Products

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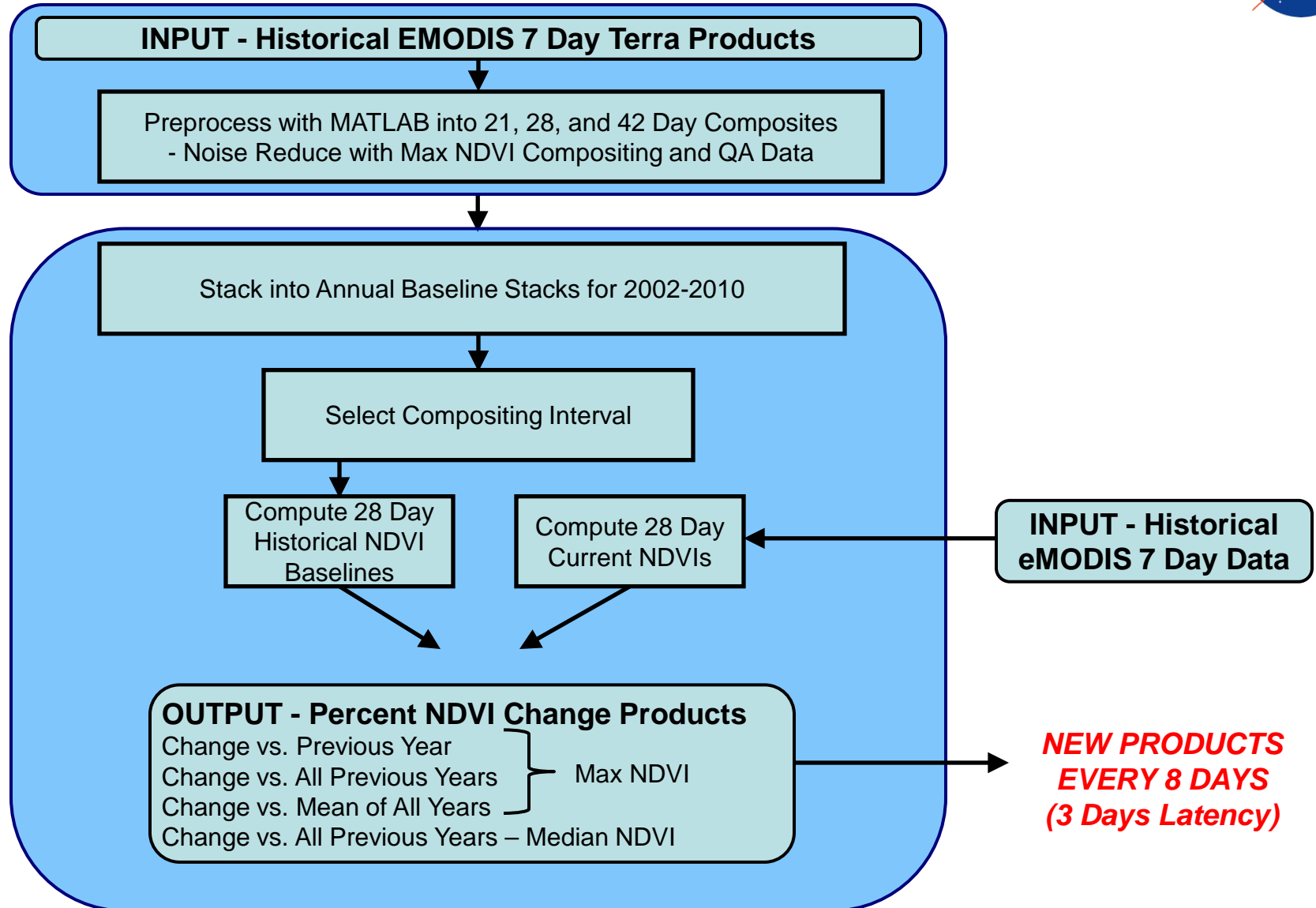
Goal and Objectives



- Goal - develop ForWarn near real time Alaska forest monitoring capability
- Objective 1 – Assess if eMODIS Terra historical data can be processed into effective NDVI forest change products
- Objective 2 – Assess if 7-day eMODIS Terra historical data will suffice with its 3 day product latency
- Objective 3 – Gauge potential benefit in adding MODIS Aqua data as inputs to deriving needed change products

Process Tested for Alaska MODIS NDVI Change Products

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Schedule for 28 Day Compositing Windows

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Temporal Window #	Beginning Date	Ending Date
W1	6/4/2010	7/1/2010
W2	6/11/2010	7/8/2010
W3	6/18/2010	7/15/2010
W4	6/25/2010	7/22/2010
W5	7/2/2010	7/29/2010
W6	7/9/2010	8/5/2010
W7	7/16/2010	8/12/2010
W8	7/23/2010	8/19/2010
W9	7/30/2010	8/26/2010

Alaska 2010 – Spring/Summer Drought



6-8-2010

6-15-2010

6-22-2010

6-29-2010

7-6-2010

7-13-2010

7-20-2010

7-27-2010

Intensity:



D0 Abnormally Dry



D1 Moderate Drought



D2 Severe Drought



D3 Extreme Drought



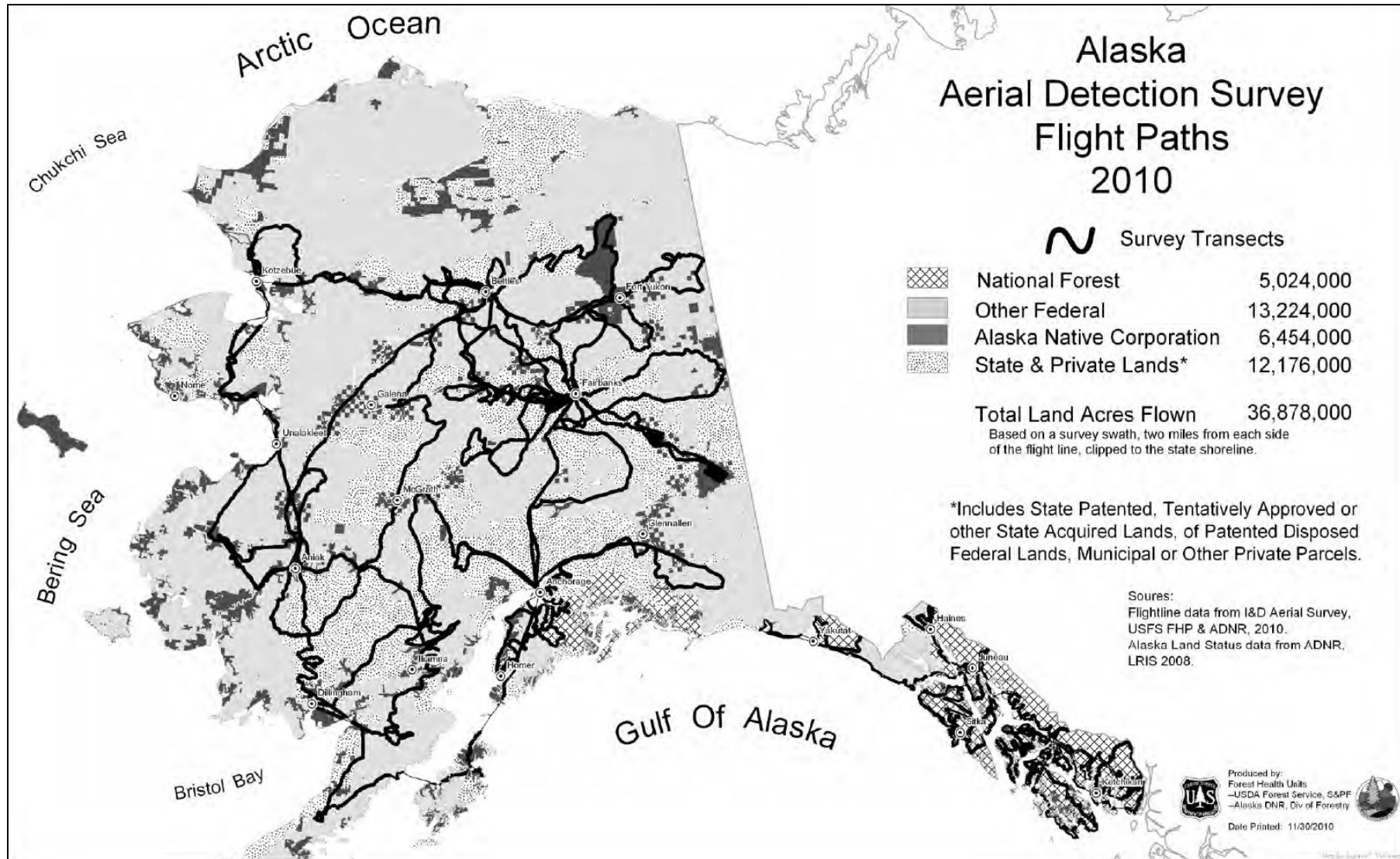
D4 Exceptional Drought

Flight Lines of Alaska 2010 Aerial Detection Survey (ADS)

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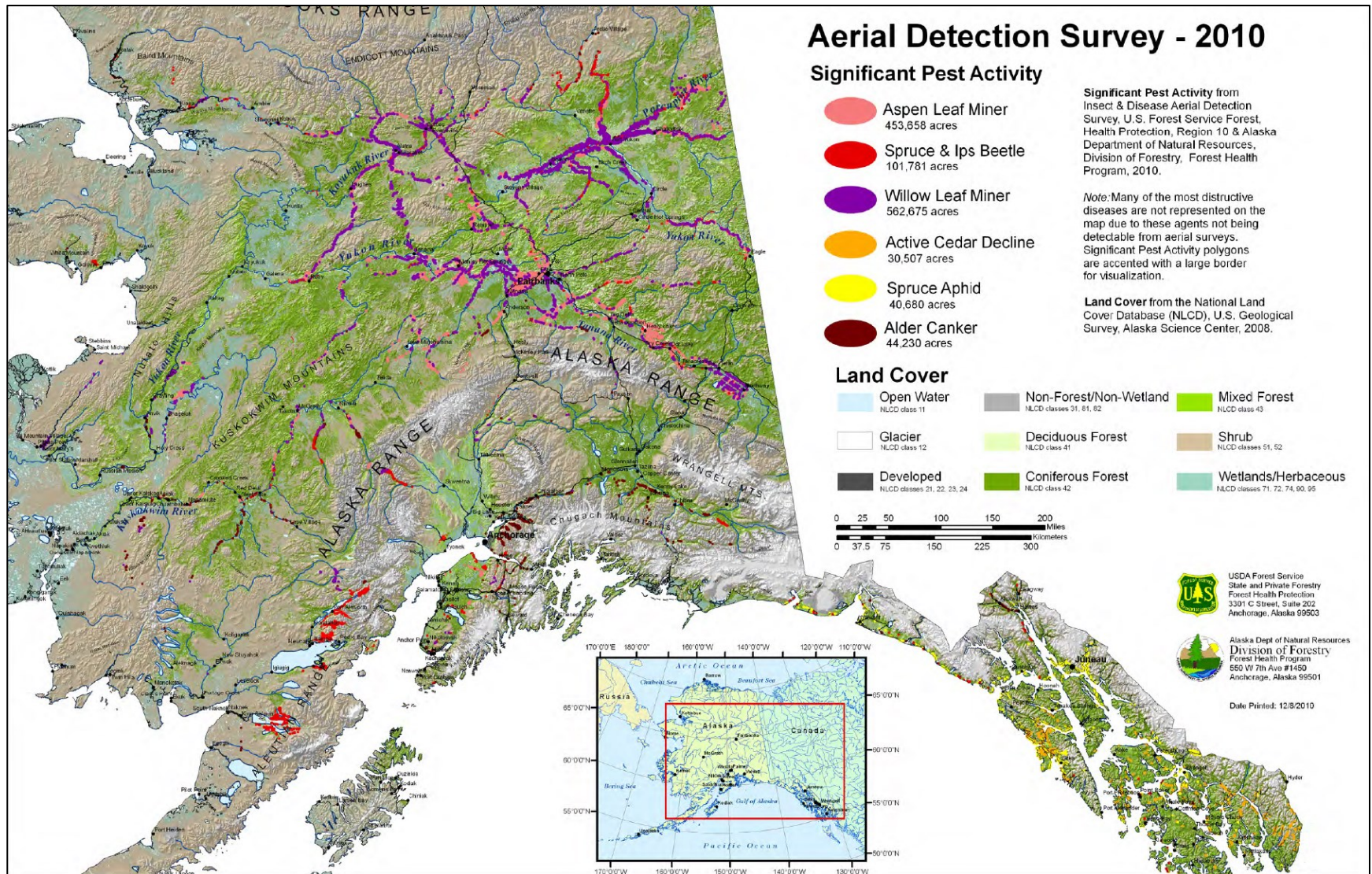


2010 ADS Mapped ~ 29% of Total Alaskan Forest Lands



Results of Alaska 2010 Aerial Detection Survey (ADS)

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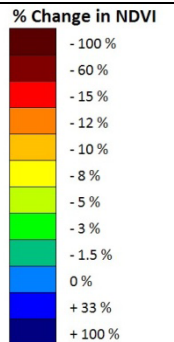
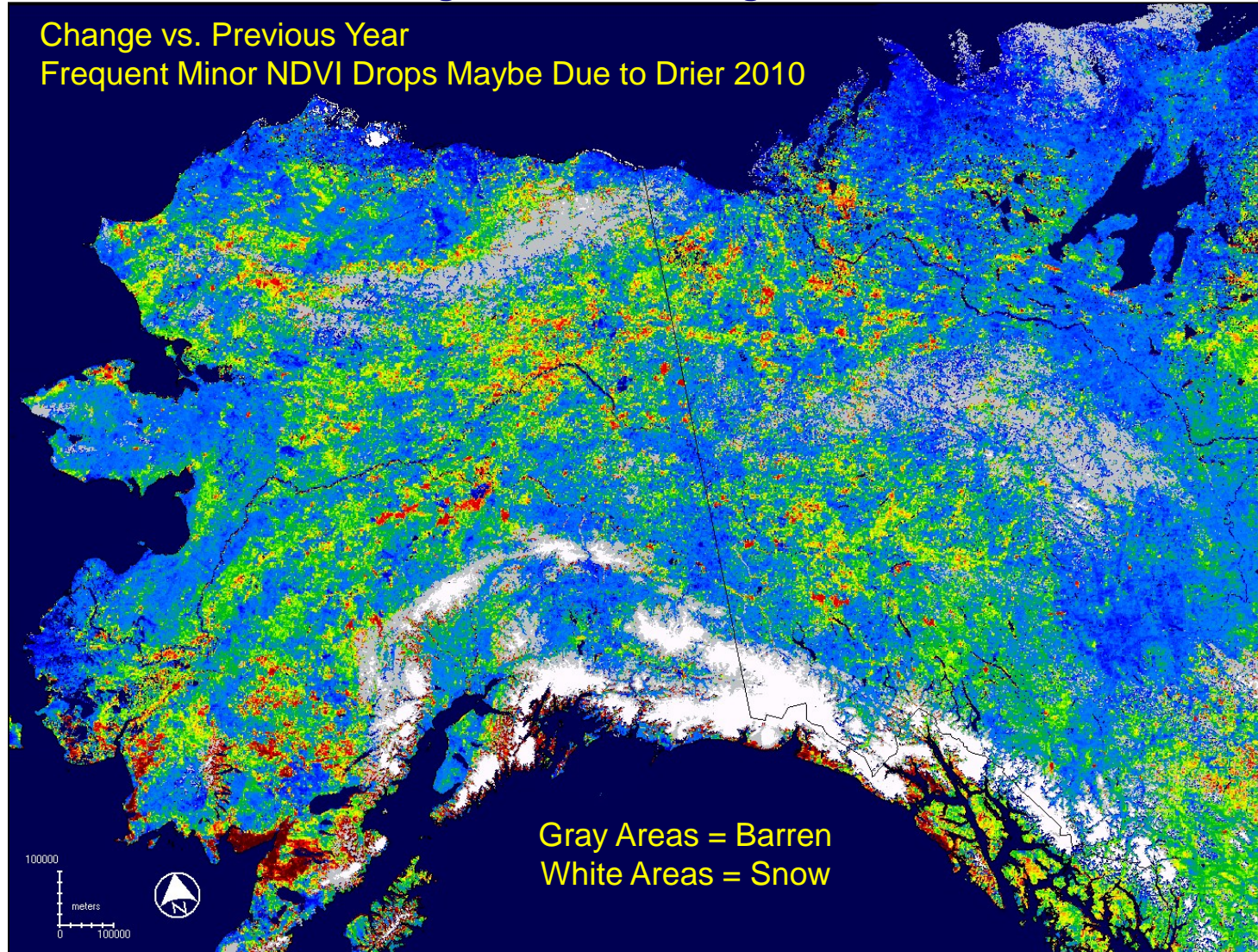
MODIS Percent NDVI Land Change (Previous Year Max NDVI Baseline)

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Change for Date Ending 7/29/2010

Change vs. Previous Year
Frequent Minor NDVI Drops Maybe Due to Drier 2010



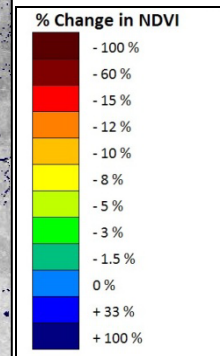
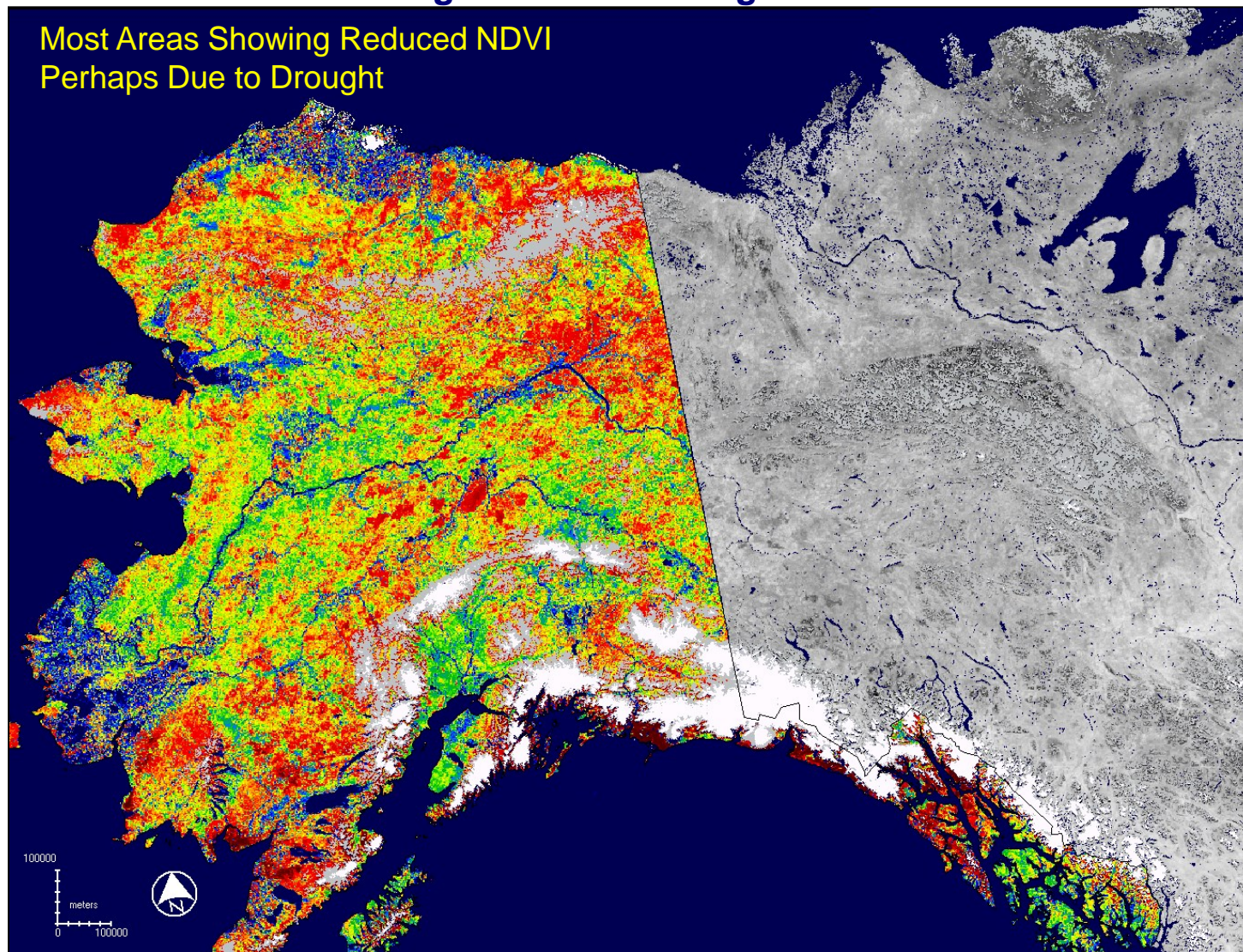
MODIS Percent NDVI Land Change (All Previous Years Max NDVI Baseline)

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Change for Date Ending 7/29/2010

Most Areas Showing Reduced NDVI
Perhaps Due to Drought



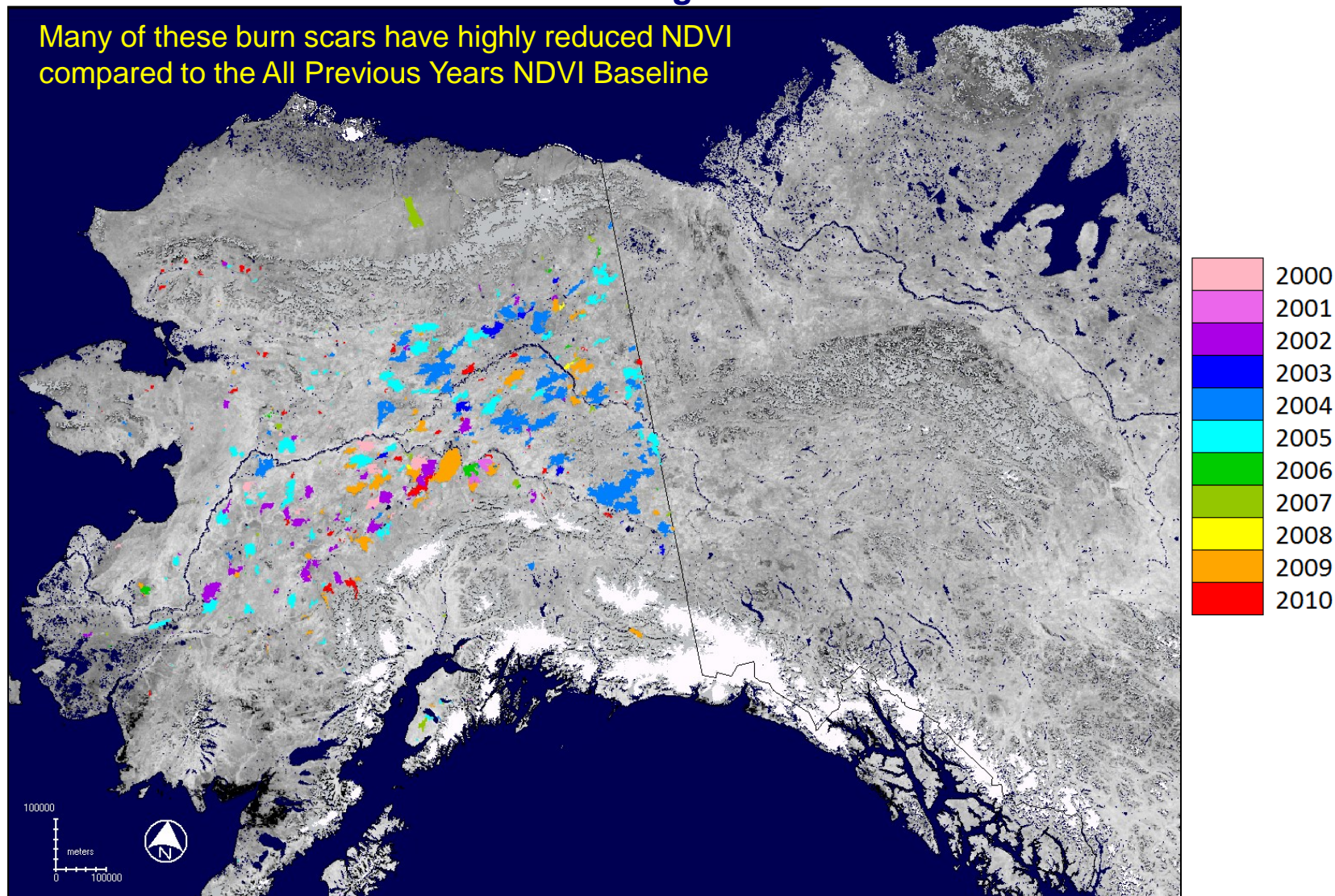
Historic Fires from 2000-2010 Overlain onto 28 Day NDVI

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NDVI for Date Ending 7/29/2010

Many of these burn scars have highly reduced NDVI compared to the All Previous Years NDVI Baseline

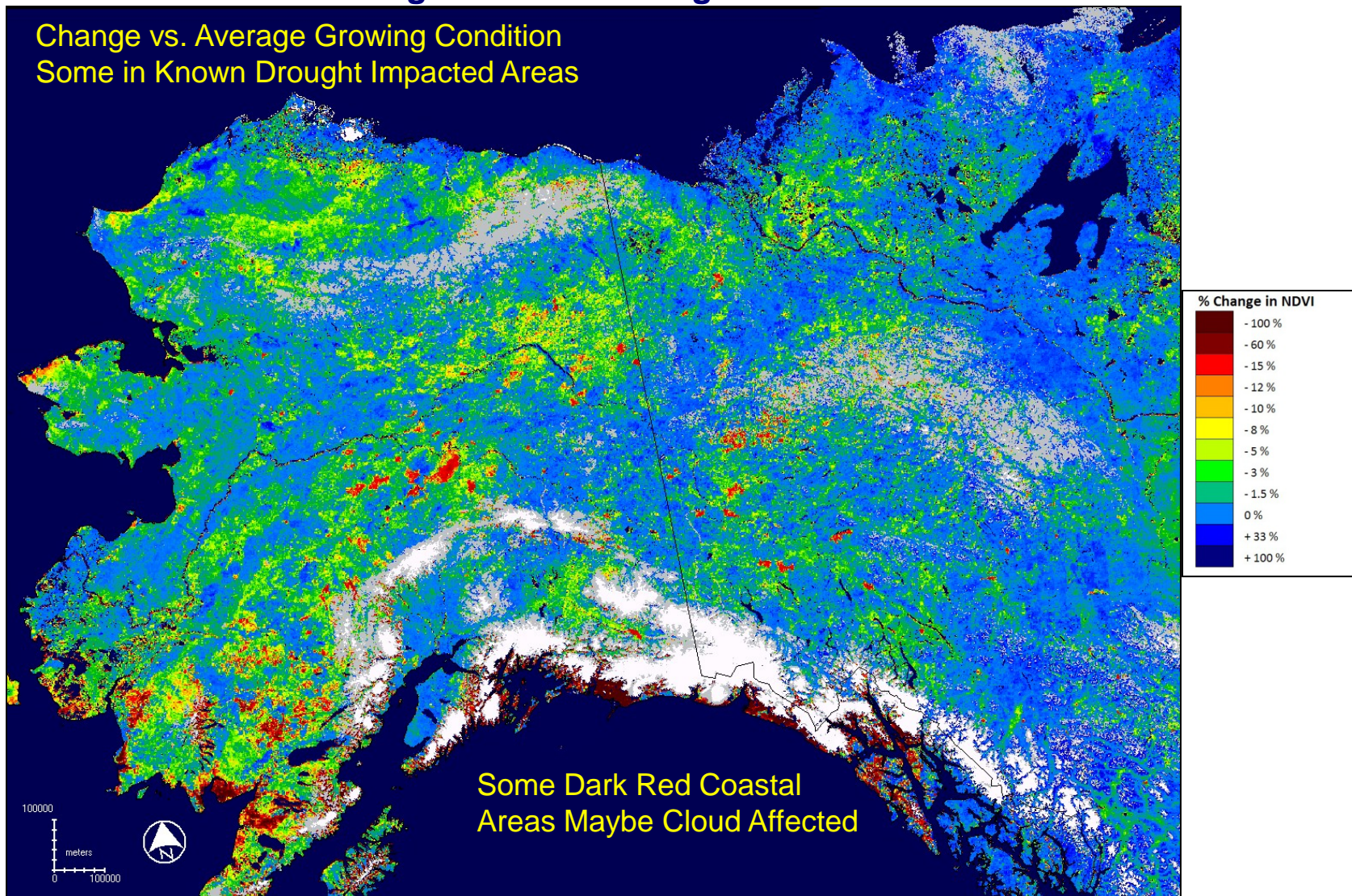


MODIS Percent NDVI Land Change (Mean of Max NDVI Baseline)

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Change for Date Ending 7/29/2010

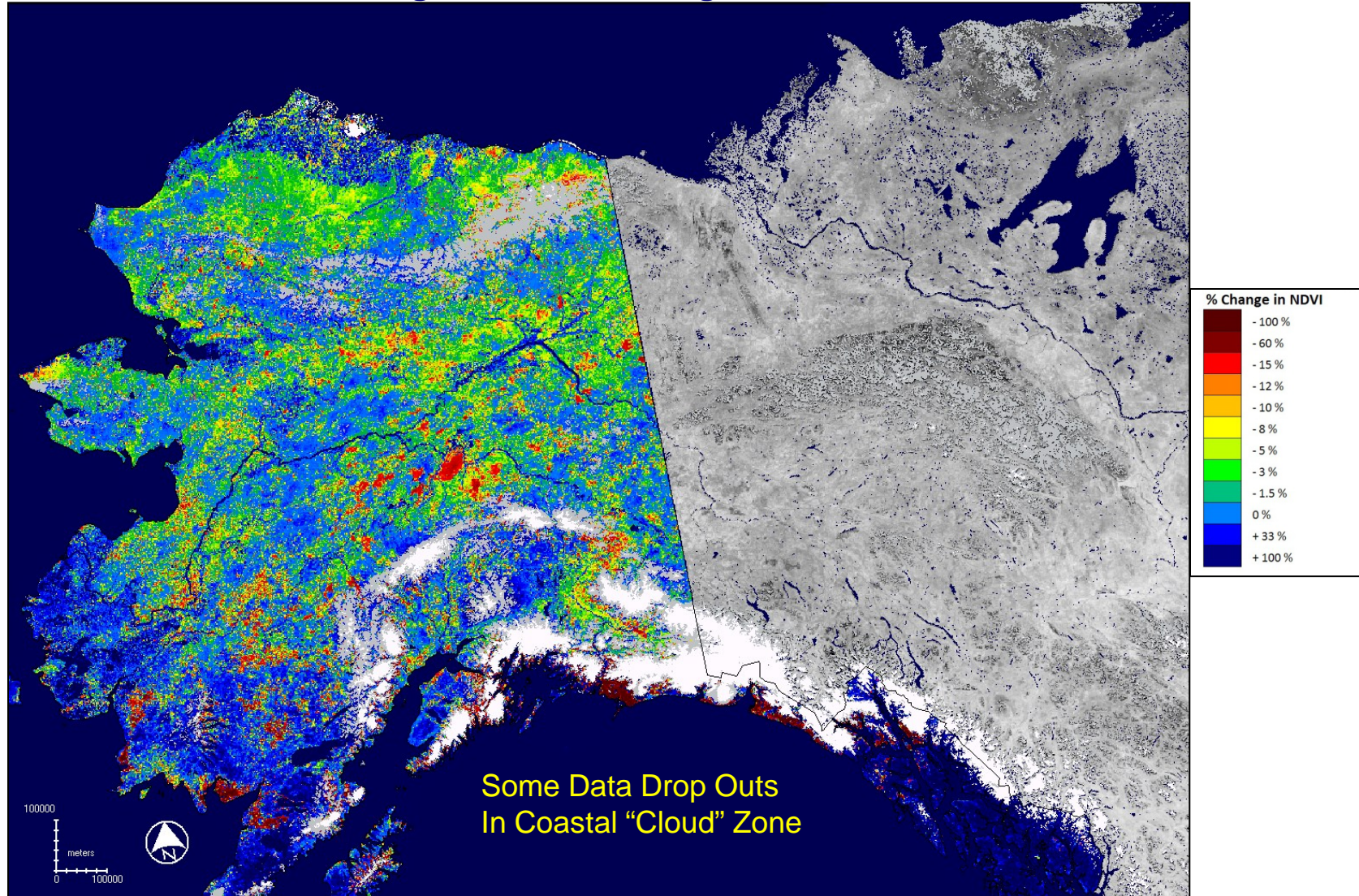


MODIS Percent NDVI Land Change (All Previous Years Median NDVI Baseline)

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Change for Date Ending 7/29/2010

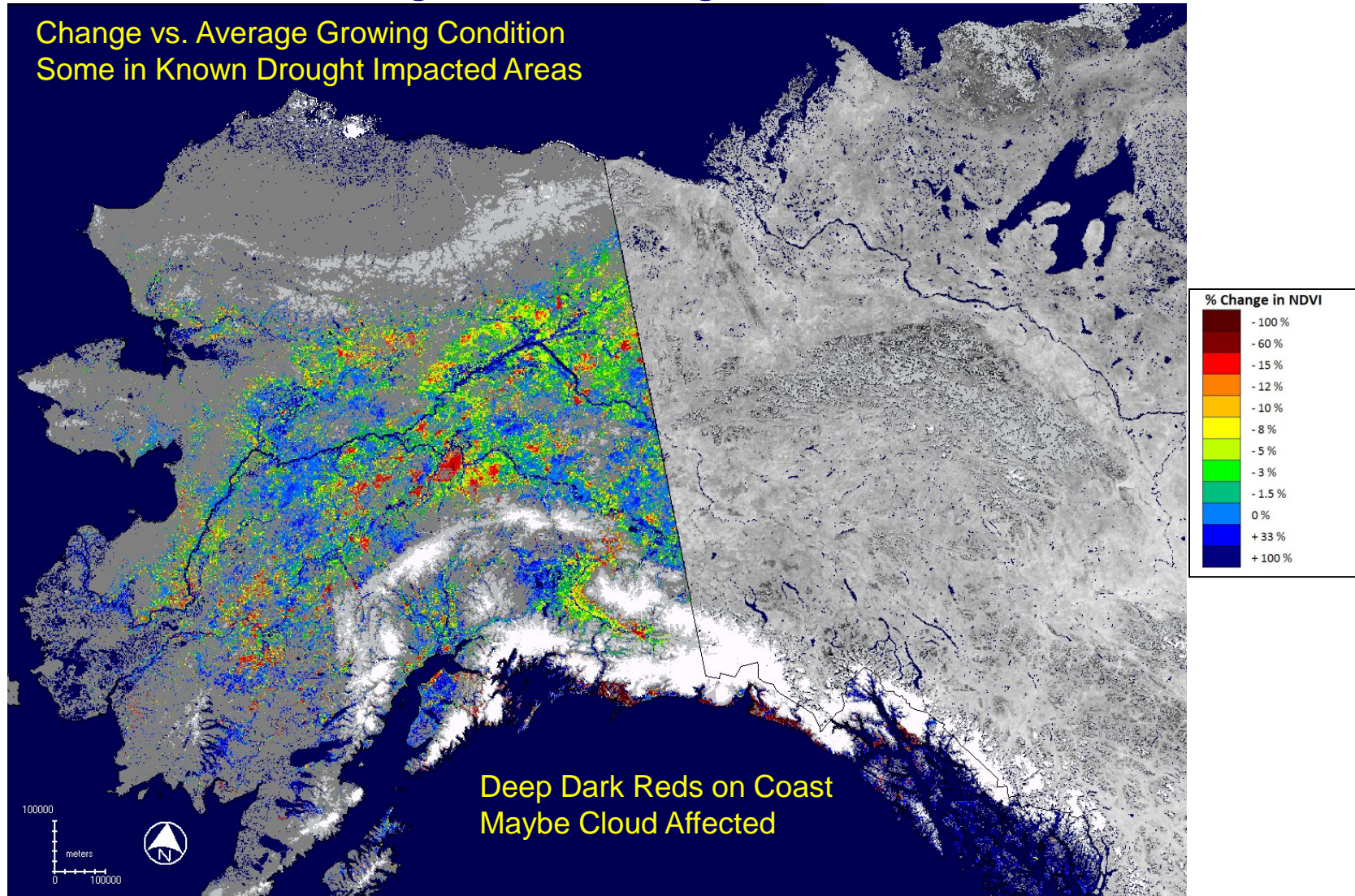


MODIS Percent NDVI Forest Change (Mean of Max NDVI Baseline)

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Change for Date Ending 7/29/2010

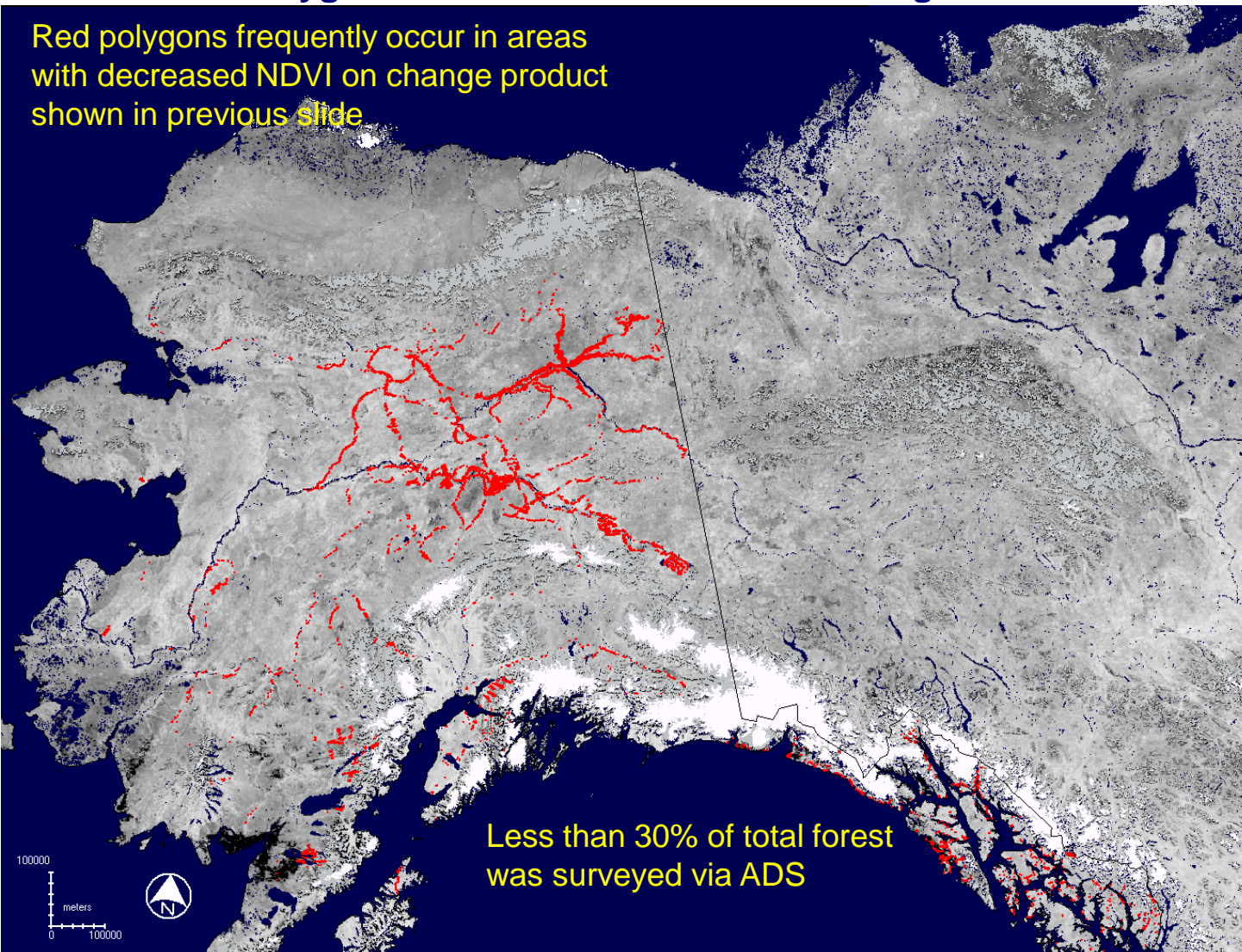


2010 ADS Forest Damage Polygons Overlain Onto 28 Day MODIS NDVI

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ADS Polygons in Red - NDVI for Date Ending 7/29/2010

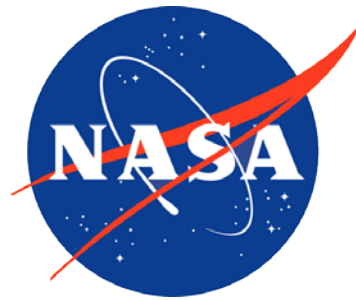


Comments on Initial Results



- EMODIS Terra Products

- *The 28 day NDVI change products showed some utility for assessing regional disturbance – but more research is needed to confirm...*
- *The results suggest variable growing conditions from year to year*
- *The change products detected fire scars and showed reduced NDVI potentially related to the 2010 drought and insect impacts to forest*
- *Given the drought year, change products using the mean of max NDVI baseline seemed to work best, but still are more noisy than the ForWarn CONUS products using MODIS Terra and Aqua data*
- *ForWarn MODIS NDVI change products have been used to detect many regional forest disturbances across CONUS*
- *The compositing window could possibly be narrowed to 21 days if MODIS Aqua data were also provided by eMODIS*
- *The apparent 3 day latency of EMODIS historic Alaska products makes it possible for ForWarn expand into Alaska*



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